

Message Text

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PLS. PASS TO DR. DIXY LEE RAY, ASST. SECRETARY, HOUSE GUEST
OF AMB. AND MRS. AUSTAD

1. USAEC RESPONSE TO HOT PARTICLE PROBLEM PUBLISHED SEPT.
1974 AS WASH-1320, "A RADIobiOLOGICAL ASSESSMENT OF THE
SPATIAL DISTRIBUTION OF RADIATION DOSE FROM INHALED
PLUTONIUM". SUMMARY OF TEXT FOLLOWS:

QUOTE 1. RECOGNITION OF THE IMPORTANCE OF SPATIAL DISTRIBUTION OF DOSE TO RADIATION PROTECTION PRACTICES BY NATIONAL AND INTERNATIONAL STANDARDS SETTING ORGANIZATIONS AND THE SCIENTIFIC COMMUNITY PREDATES THE DISCOVERY OF PLUTONIUM. CONTINUED EXAMINATION OF THE RADIobiOLOGICAL ASPECTS OF THE SPATIAL DISTRIBUTION OF DOSE, ESPECIALLY AS REGARDS ALPHA-EMITTING PARTICLES, HAS NOT LED TO MAJOR CHANGES IN RADIATION PROTECTION STANDARDS. HOWEVER, THE PROBLEM IS AND SHOULD BE CONTINUALLY REASSESSED.

2. EXPERIMENTAL ANIMAL STUDIES CLEARLY INDICATE THAT INHALED RADIOACTIVE PARTICLES MOVE FROM THE LUNG TO OTHER ORGANS AND MAY BE EXCRETED FROM THE BODY BY SEVERAL MECHANISMS. THE EXPERIMENTAL DATA ALSO SHOW THAT THE UNIFORM DISTRIBUTIONS OF INHALED RADIONUCLIDES IN LUNG SELDOM, IF EVER, OCCUR. HOWEVER, BECAUSE OF THE MOBILITY
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OF PLUTONIUM WITHIN LUNG, THERE IS SOME BIOLOGICAL

JUSTIFICATION FOR AVERAGING THE RADIATION DOSE TO THE
TOTAL TISSUE.

3. ALTHOUGH PARTICLES DEPOSITED IN LUNG ARE DYNAMIC AND MOBILE UNLESS TRAPPED, I.E., IN SCAR TISSUE, EXPERIMENTS HAVE SIMULATED THE STATIC PLUTONIUM PARTICLE TO STUDY THE BIOLOGICAL EFFECTS OF TRULY 'HOT SPOTS' OF RADIOACTIVITY IN LUNG. THESE AND OTHER COMPARATIVE EXPERIMENTS OF UNIFORM AND NONUNIFORM DISTRIBUTIONS OF ABSORBED ENERGY FROM RADIOACTIVE PARTICLES SUGGEST A BIOLOGICAL SPARING EFFECT FOR BOTH ACUTE AND LATE RESPONSES TO THE NONUNIFORM DISTRIBUTION. AVAILABLE EXPERIMENTAL DATA INDICATE THAT AVERAGING THE ABSORBED ALPHA RADIATION DOSE FROM PLUTONIUM PARTICLES IN LUNG IS RADIOBIOLOGICALLY SOUND.

4. DOSIMETRIC MODELS USED TO PREDICT LUNG TUMOR PROBABILITY IN ANIMALS AND IN HUMAN BEINGS ARE BIOLOGICALLY DEFICIENT, PRIMARILY BECAUSE OF THE LACK OF THE REQUIRED BIOLOGICAL INFORMATION. ALSO, MOST MODELS ARE BASED ON STUDIES OF TUMOR INDUCTION IN IRRADIATED RAT SKIN AND ON THE ASSUMED VALIDITY OF EXTRAPOLATING TO LUNG TISSUE. THIS PRACTICE IS QUESTIONABLE FOR SEVERAL REASONS INCLUDING THE FACT THAT THE RESULTS OF STUDIES WITH RATS, I.E., TUMOR TYPE, VARY WITH RAT STRAINS AND THAT THE RESULTS OF COMPARABLE STUDIES OF IRRADIATED MOUSE SKIN HAVE NOT GIVEN RESULTS IDENTICAL TO THE RAT EXPERIMENTS. THUS, USE OF THESE MODELS CAN LEAD TO ERRONEOUS PREDICTIONS OF TUMOR PROBABILITIES.

5. CONSIDERATION OF MECHANISMS OF RADIATION CARCINOGENESIS SUGGESTS THAT THERE HAS BEEN NO CHANGE IN DIRECTION OR STRENGTH OF DATA WHICH WOULD COMPEL DEPARTURE FROM THE CONCEPT THAT AVERAGE LUNG DOSE FOR ALPHA PARTICLES PROVIDES A REASONABLE AND CONSERVATIVE BASE FOR PROTECTION.

6. AFTER THIRTY YEARS EXPERIENCE WITH PLUTONIUM IN LABORATORY AND PRODUCTION FACILITIES, THERE IS NO UNCLASSIFIED

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EVIDENCE THAT THE MEAN DOSE LUNG MODEL ON WHICH OCCUPATIONAL RADIATION PROTECTION STANDARDS FOR PLUTONIUM ARE BASED IS GROSSLY IN ERROR OR LEADS TO HAZARDOUS PRACTICES. CURRENTLY AVAILABLE DATA FROM OCCUPATIONALLY EXPOSED PERSONS INDICATE THAT THE NON-HOMOGENEOUS DOSE DISTRIBUTION FROM INHALED PLUTONIUM DOES NOT RESULT IN DEMONSTRABLY GREATER RISK THAN THAT ASSUMED FOR A UNIFORM DOSE DISTRIBUTION. THUS, EMPIRICAL CONSIDERA-

TIONS LEAD TO THE CONCLUSION THAT THE NONUNIFORM DOSE
DISTRIBUTION OF PLUTONIUM PARTICLES IN THE LUNG IS NOT

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MORE HAZARDOUS AND MAY BE LESS HAZARDOUS THAN IF THE
PLUTONIUM WERE UNIFORMLY DISTRIBUTED AND THAT THE MEAN
DOSE LUNG MODEL IS A RADIobiologically SOUND BASIS FOR
ESTABLISHMENT OF PLUTONIUM STANDARDS. UNQUOTE

2. 142 REFERENCES.
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